and customers in their territories. In addition, the Commission should state that any suspension or modification granted to a LEC that can make such a showing must be narrowly tailored to address the particular harm that the state may find.

CONCLUSION

With this NPRM, the Commission is poised to deliver to the American public the benefits that the 1996 Act contemplates. Realizing that promise now requires the Commission fully to meet its duty under the Act to adopt firm and detailed rules and policies to assure that all consumers, in all states, enjoy the increased quality, value, innovation and choice that only competition will produce. At the same time, the Commission must continue to recognize that this NPRM, broad as it is, represents only a part of the work needed to

enable competition to emerge. That effort will not be complete unless and until access charge and subsidy reform is also concluded, so that all prices charged by incumbent LECs to other carriers reflect true economic costs.

Respectfully submitted,

AT&T CORP.

By MC Rosenblum/REH

Mark C. Rosenblum
Roy E. Hoffinger
Stephen C. Garavito
Richard H. Rubin

Its Attorneys

Joel E. Lubin
Richard N. Clarke
Karen E. Weis

295 North Maple Avenue
Room 3245I1
Basking Ridge, New Jersey 07920
(908) 221-2631

David W. Carpenter
Peter D. Keisler
David L. Lawson
David M. Levy

Sidley & Austin
1722 Eye Street, N.W.
Washington, D.C. 20006

Attorneys for AT&T Corp.

May 16, 1996

Cardinal®

59A60

Loop Elements
Illustrative Example
Using Technical Standard
Interfaces for Interconnection
Issue 1

Subloop Elements
Distribution
Concentrator/Multiplexer
and Feeder

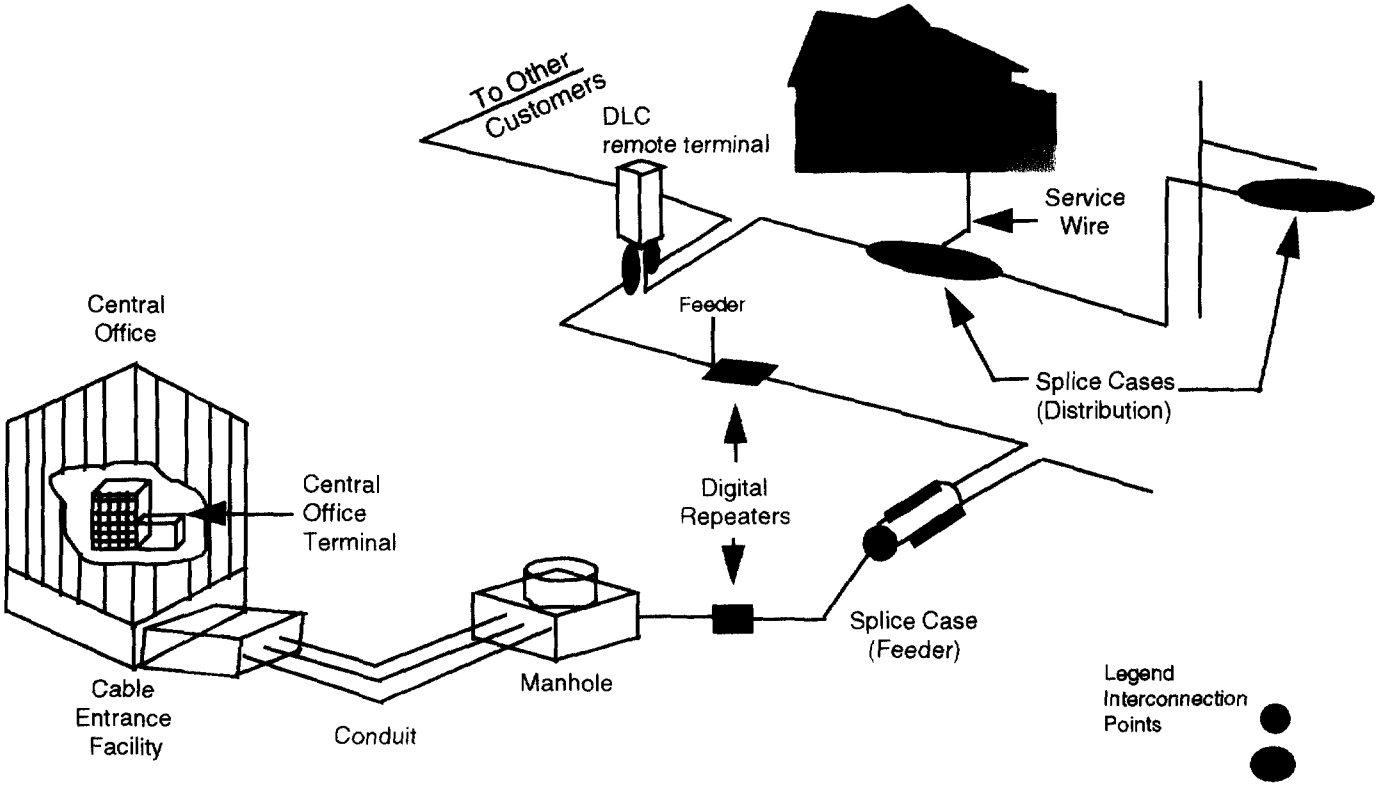


Figure 1 Central Office to the Home

Network Elements Connected via Industry Technical Standards:

- ANSI T1.403 - 1989 American Standard for Telecommunications-Carrier to Customer Installation, DS1 Metallic Interface Specification

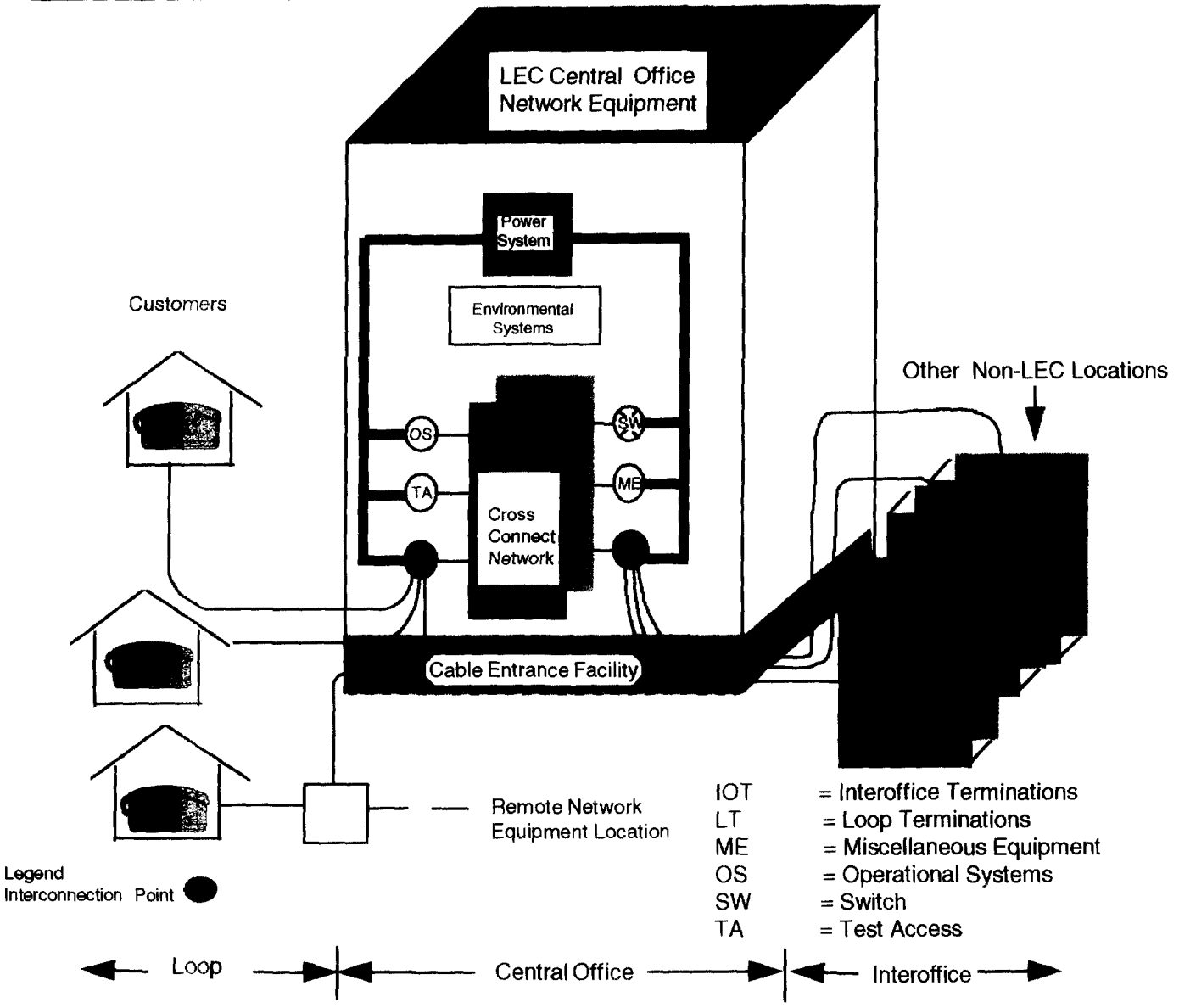


Figure 2 - End Office Switching

Network Elements Connected via Industry Technical Standards:

- ANSI T1.401.01-1994 Interface Between Carriers and Customer Installations - Analog Voice Grade Switched Access Lines Using Loop-Start and Ground-Start signaling with Line-Side Answer Supervision Feature.

Transport
Illustrative Example
Using Technical Standard
Interfaces for Interconnection
Issue 1

Elements Include-
TandemSwitching;
Dedicated and Common
Transport

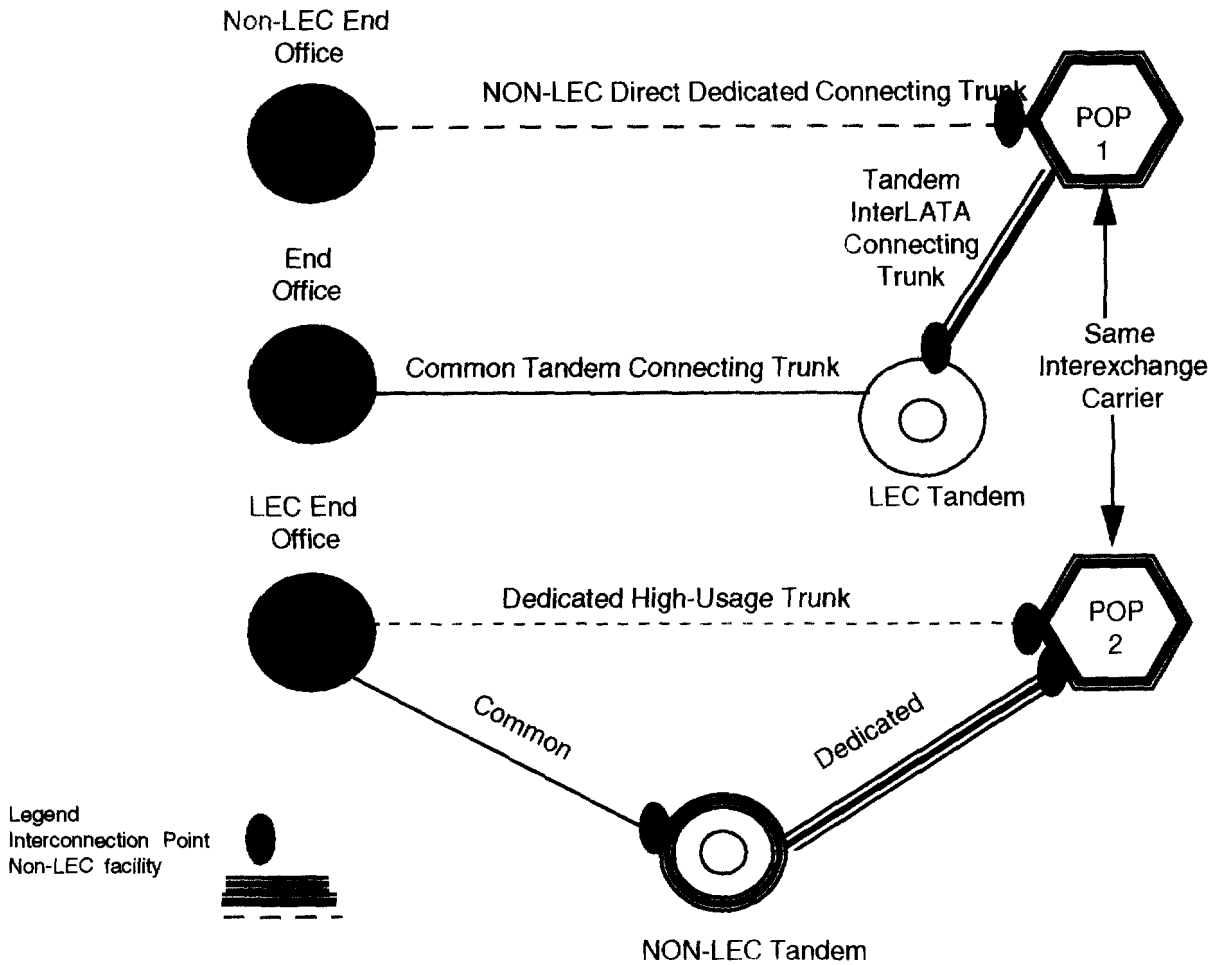


Figure 3 - Transport Facilities

Network Elements Connected via Industry Technical Standards:

- ANSI T1.107b- 1991 - American National Standard for Telecommunications- Digital Hierarchy - Supplement to Formats Specifications
- ANSI T1. 107-1988 American National Standard for Telecommunications - Digital Hierarchy -Formats Specifications

Operator Systems
Illustrative Example
Using Technical Standard
Interfaces for Interconnection
Issue 1

Operator Systems
LEC and IXC Providers

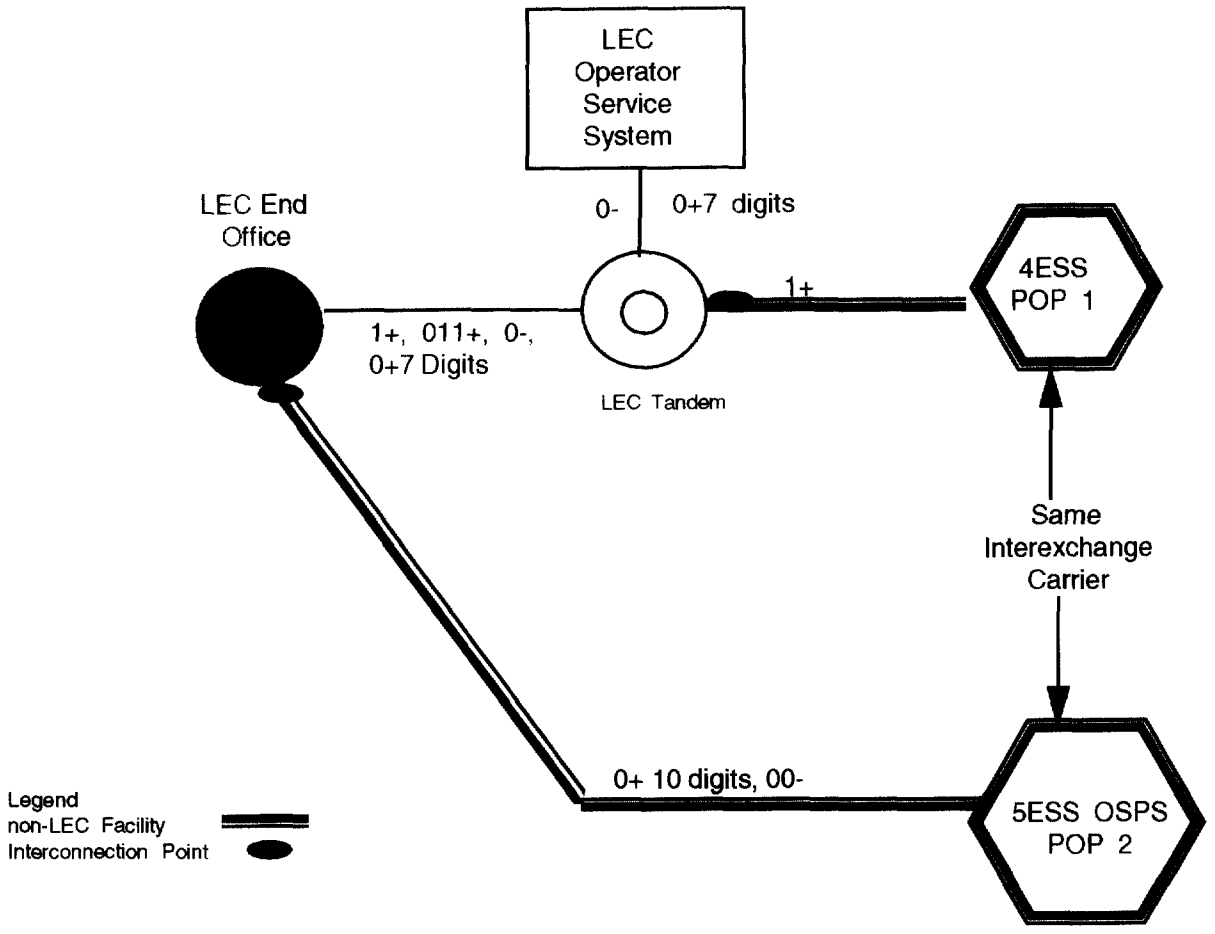


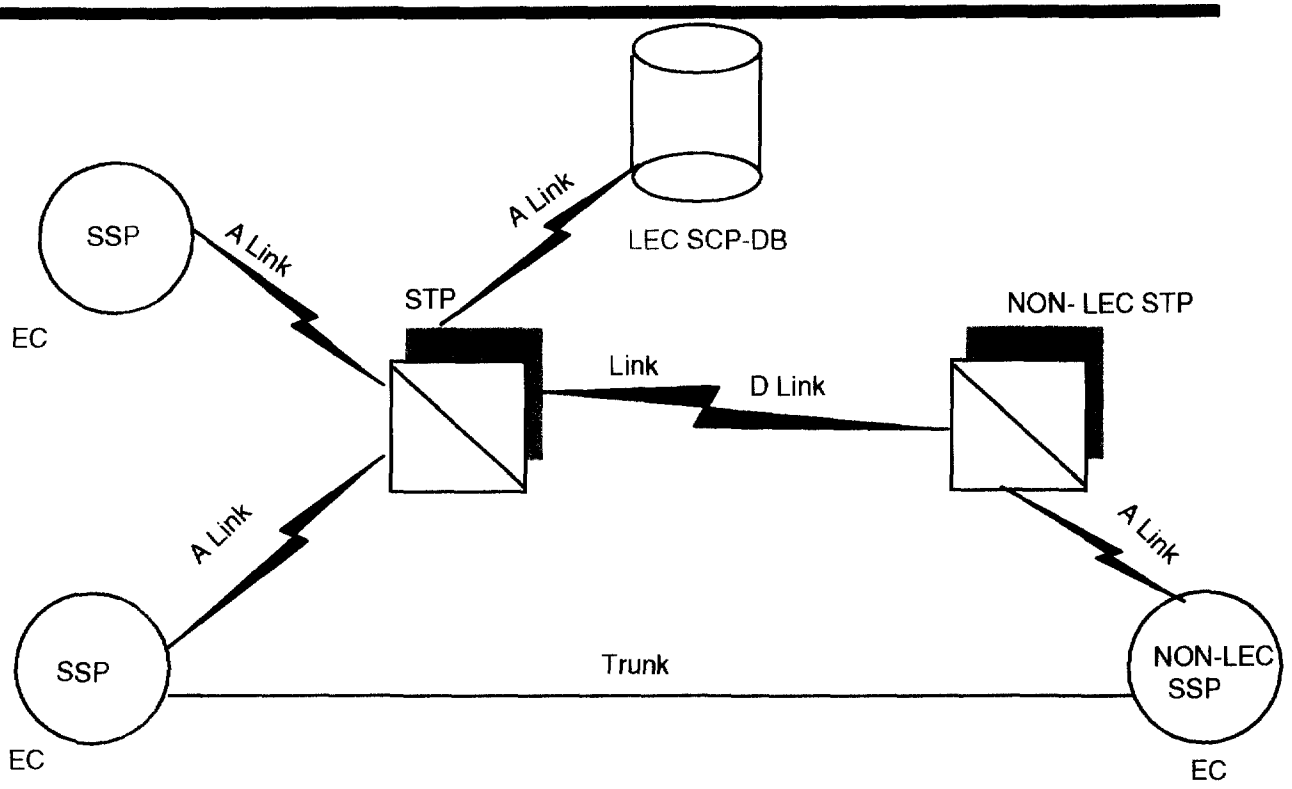
Figure 4 - Operator Services

Network Elements Connected via Industry Technical Standards:

- ANSI X3.4-1986, Coded Character Set 7-bit American National Code for Information Exchange, Issue 1

Signaling Systems
Illustrative Example
Using Technical Standard
Interfaces for Interconnection
Issue 1

Signaling Systems -
A Links, D Links,
Signal Transfer Point,
Service Control Point



Legend:
DB = Database
EC = Exchange Carrier
SCP = Service Control Point
SSP = Service Switching Point
STP = Signaling Transfer Point

Figure 5 - Signaling System Interconnection Options

Network Elements Connected via Industry Technical Standards:

- ANSI T1.111.2 Signaling Data Link Functions
- ANSI T1.111.3 Signaling Link Functions
- ANSI T1.111.4 Signaling Network Management Functions

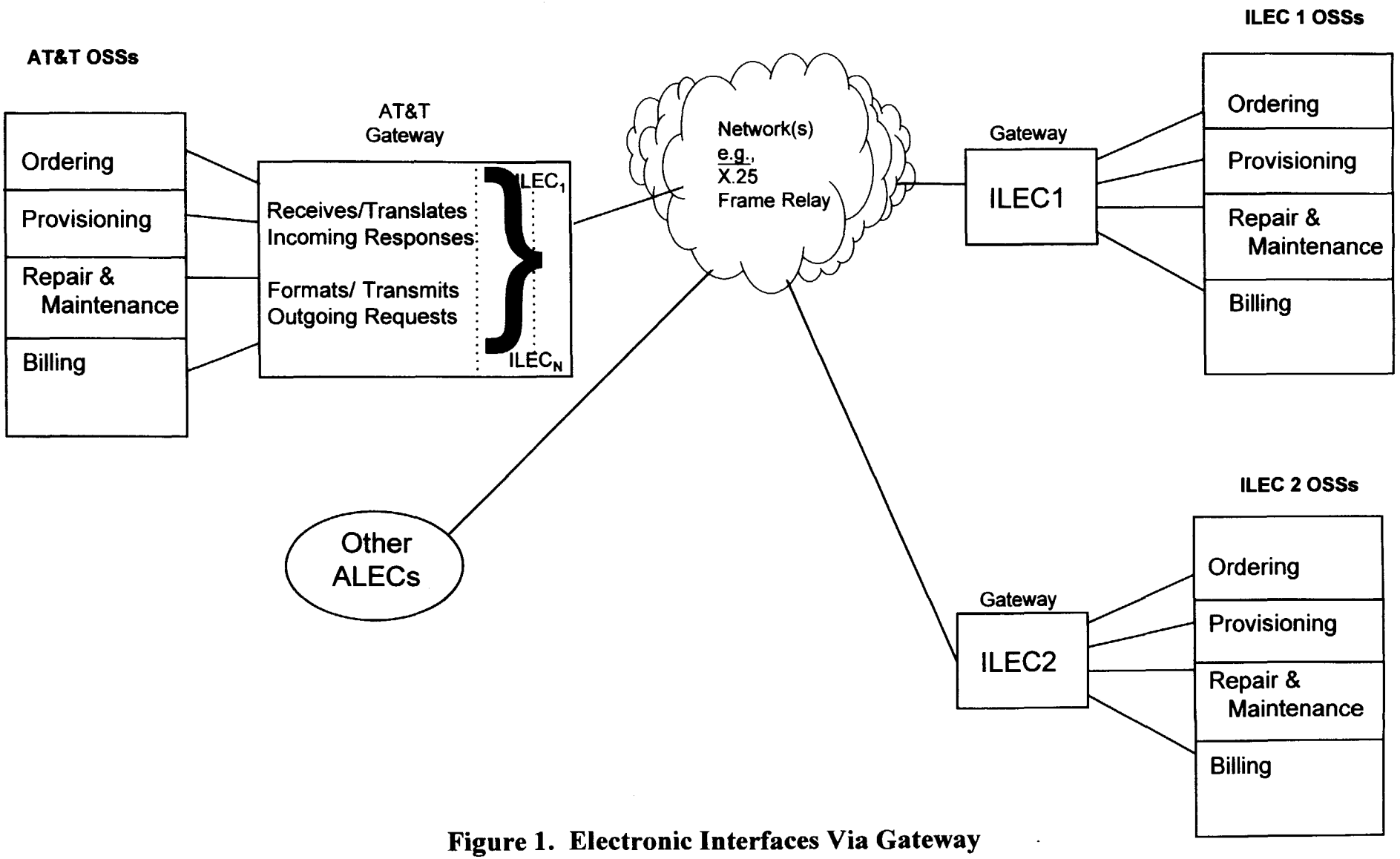


Figure 1. Electronic Interfaces Via Gateway

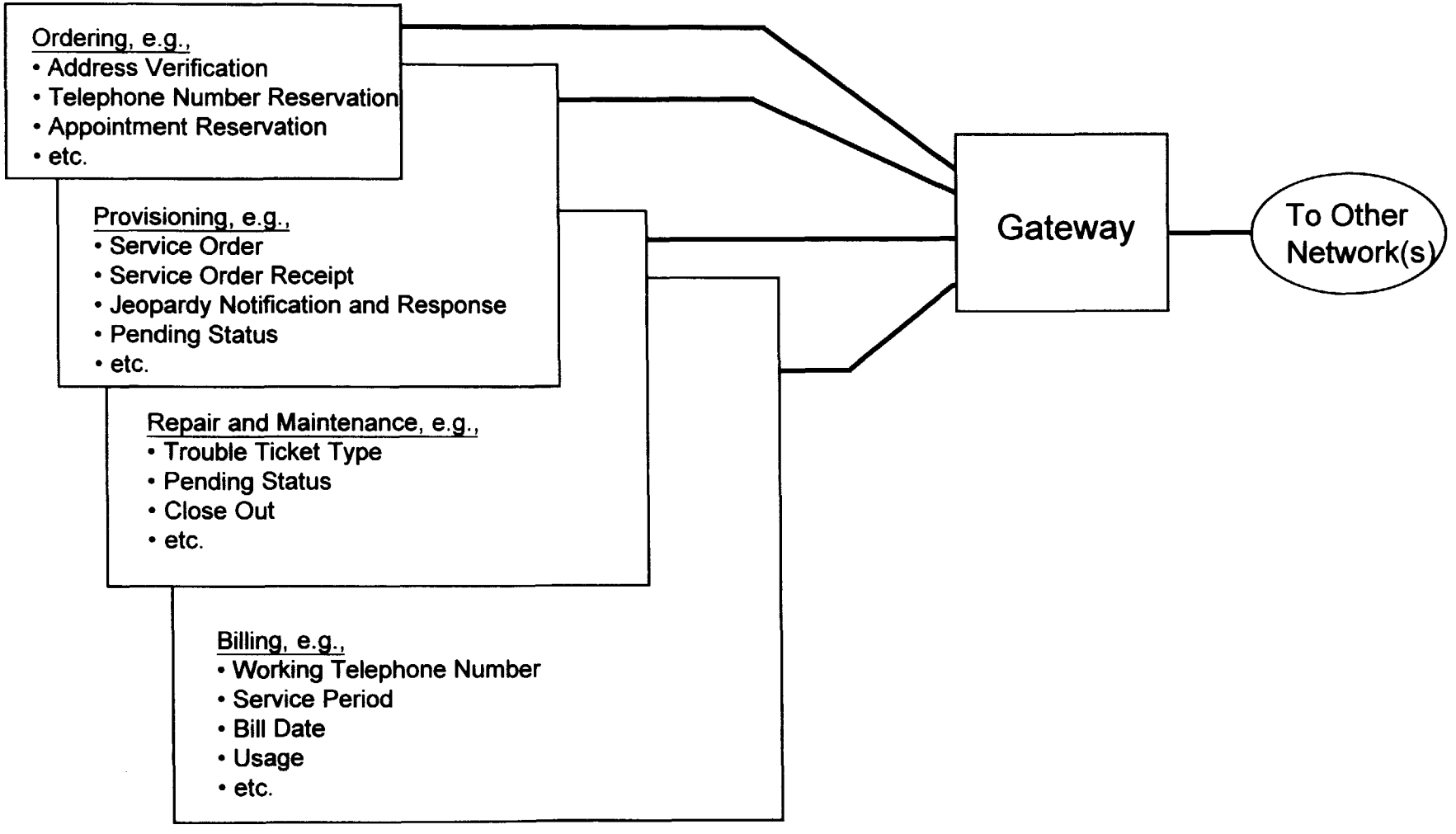


Figure 2. Sample Transactions Sets

C

AFFIDAVIT OF WILLIAM J. BAUMOL,
JANUSZ A. ORDOVER, AND ROBERT D. WILLIG

1. Our names are William J. Baumol, Janusz A. Ordover, and Robert D. Willig. William J. Baumol is Director of the C.V. Starr Center for Applied Economics at New York University and Professor Emeritus at Princeton University. His *curriculum vitae* appears as Attachment A. Janusz A. Ordover is Professor of Economics at New York University. His *curriculum vitae* appears as Attachment B. Robert D. Willig is Professor of Economics and Public Affairs at Princeton University. His *curriculum vitae* appears as Attachment C.

2. We submit this affidavit in response to the Commission's April 19, 1996 Notice of Proposed Rulemaking in CC Docket No. 96-98, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*. The Commission has proposed in its Notice to require ILECs (1) to offer unbundled network elements and interconnection services for sale to competitive local exchange carriers ("CLECs"), to the fullest practical extent, individually and in flexibly defined groups; (2) to price those network elements (as well as related interconnection and collocation) at competitive prices based on the economic costs of providing the network elements; and (3) to sell bundled services at wholesale to other carriers for resale. We applaud all three proposals.

3. Our focus in this affidavit is on the pricing of network elements. Adoption of economically defensible standards for pricing unbundled network elements is perhaps the single most critical aspect of the Commission's proposals. As we explain below, consistent with the competitive pricing contemplated by the Act, a defensible pricing standard must be based on forward-looking economic costs, not historic book costs, because the expansion, contraction, entry and exit decisions of competitors efficiently and necessarily turn on expected prices and costs and have nothing to do with costs expended historically or reflected on accounting books.

In the circumstances presented here, we conclude that the appropriate forward-looking benchmark for pricing is total service long run incremental cost, or TSLRIC. We further conclude that a cost model developed by Hatfield Associates, Inc. provides good empirical estimates of the TSLRIC of basic network elements.

4. Passage of the 1996 Telecommunications Act offers an invaluable opportunity to extend the benefits of competition to users of every product and segment of the industry, especially the local exchange, where competition has been least extensive and effective. Availability of unbundled network elements for sale at prices based on economic costs will foster efficient and prompt competition at all levels -- from resale alone at one end of the spectrum, to fully facilities-based at the other, and through the broad middle range of partially-facilities based competition. All of these forms of competition can benefit end users, bringing new vitality, innovation, pressures for cost-efficiency, and superior customer service to the market. But the fundamental policy of the 1996 Act -- extending all forms of competition to the markets where it is now absent -- cannot be attained unless the pricing principles discussed here are carried out. Misguided allegiance to prior regulatory norms or departure from the logic of free and competitive markets would frustrate the central goals of the Act.

I. THE PROPER MEASURE OF THE ECONOMIC COST OF UNBUNDLED NETWORK ELEMENTS IS TOTAL SERVICE LONG RUN INCREMENTAL COST ("TSLRIC").

A. Pricing of Network Elements Should Be Based On Economic Costs, Not Book Costs.

5. Where, as here, markets are ineffectively competitive and regulatory oversight is warranted, regulators should set prices that replicate, as closely as possible, the prices that would prevail in competitive markets. Under this competitive standard, prices accomplish several crucial goals for economic efficiency and consumer benefits. First, prices should steer

purchasers to the most efficient, least-cost suppliers of each good or service for which there is sufficient demand. Second, prices should guide purchasers to make efficient choices among *different* goods and services offered in the market. Third, prices should achieve the level of cost recovery that encourages efficient levels of investment, entry and exit. These criteria dictate that network elements be priced on the basis of economic costs, not book or embedded costs.

6. Economic costs are calculated from the standpoint of building production and service capability *today*, at current input prices, and in the fashion that is most cost effective in light of today's available technology, input prices, and expectations about demand. For services that are not in decline, and that are expected to show demand sufficient for new and replacement investment, economic costs are long-run costs that reflect forward-looking efficient investment, including a return on capital consistent with competitive capital markets.

7. Both efficiency and the competitive model dictate this result. In competitive markets, efficient decisions about market entry, exit, expansion, and contraction are made by comparing the anticipated revenue with the anticipated incremental costs of the contemplated change in output. Historical expenditures, and amounts reflected on accounting books, are irrelevant to this calculus.

8. The basing of network element prices on book accounting costs, by contrast, would create new ILEC opportunities for inefficiency. If network element prices were based on book accounting costs, then excess ILEC spending would be rewarded with the opportunity to recover the inefficient costs through higher prices. This outcome would sustain and restore one of the worst features of traditional public utility regulation.

9. Further, basing network element prices on book accounting costs would give ILECs new opportunities to engage in anticompetitive strategic conduct by misallocating and

mischaracterizing costs. Misallocating book costs would enable ILECs to overprice the network elements purchased by rival carriers, thereby weakening or eliminating the competitive pressures for improved efficiency and service quality that the Act was intended to promote. Any costs shifted by the ILECs from competitive activities to more-protected activities would permit them to raise network element prices in the more protected domain, while escaping the need to recover those costs from the competitive activities. In this way, ILECs would have a strong incentive to price the more competitive end-user services in a predatory fashion in order to build spending opportunities.

10. Finally, disparities between economic costs and prices for network elements would result in disparities between economic costs and prices for end-user services that use those network elements as inputs. The result could be long-lasting inefficiencies in the allocation of resources to telecommunications and related sectors such as computing and information services. Such an outcome would be especially costly to society today, when fundamental decisions about the deployment and use of technology are up for grabs in the marketplace.

B. The Pertinent Measure Of Economic Cost For Pricing Network Elements Is Incremental Cost.

11. The measure of cost on which efficient prices are based, and to which efficient prices converge in competitive markets, is *incremental* cost. Incremental cost represents the *additional* cost to society of producing a particular network element or service, rather than the most valuable alternative use or uses, if all other outputs of the ILEC are held constant.[1]

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[1] Another important measure of economic cost, closely related to incremental cost, is stand-alone cost, or SAC. SAC is the economic cost of producing a service (or network element) in isolation from other outputs. Intuition, and available forward-looking engineering cost studies, indicate that for a logical aggregation of network elements, SAC does not differ significantly from long run incremental cost because there are no significant common or shared costs among (continued...)

12. Use of incremental cost pricing will best approximate the performance of competitive markets. In the long run, prices in competitive markets converge to incremental cost. Firms decide whether to expand or enter new markets by comparing the expected costs of expansion or entry with the expected incremental revenue. Likewise, firms decide whether to contract or exit by comparing the costs avoided with the expected revenues foregone.

13. Consistent with the logic of competitive markets, the pricing of network elements on the basis of incremental cost should encourage new or potential entrants in local exchange markets to make efficient make-or-buy decisions, supplying a network element through self-provision only when the entrant can do so at a lower incremental cost than the ILEC. Basing the pricing of network elements on incremental cost is also a prerequisite for efficient purchasing decisions by the *ultimate* consumers of telecommunications services. Consumers are encouraged to make optimal use of expenditures permitted by their budgets only when prices reflect the relative scarcity of each good or service available in the market.

C. The Proper Time Horizon For Determining the Incremental Costs Of Network Elements Is The Long Run.

14. The competitive market model also dictates that the costs for pricing of network elements be based upon a long-run time horizon -- i.e., a time horizon long enough that sunk costs are variable, and obsolete or inefficiently configured assets are replaced with efficiently

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[1] (...continued)
the groups of network elements. That is because those aggregative categories of network elements generally comprise discrete physical facilities -- e.g., loop, switching, transport, and signalling. Thus, there is no practical ambiguity, at this level of aggregation, in speaking about economic costs, SAC, and incremental costs interchangeably. At a finer level of disaggregation, there may well be non-trivial costs shared among various subcomponents of any particular aggregative network element. The competitive price for any such subcomponent must lie between the subcomponent's unit long run incremental cost and SAC. The revenues from the competitive prices of all the subcomponents of an aggregative network element must sum to the long run incremental cost of the aggregative network element.

configured assets under current technology.[2] In competitive markets, entry decisions are based on long run costs, for all costs of entry are variable before the necessary investment is sunk. Accordingly, the threat of potential entry in competitive markets limits prices charged by incumbent firms to the long run costs faced by an efficient potential entrant.

D. The Pertinent Increment Of Volume Is The Total Expected Demand For A Network Element Produced By An ILEC, Including Its Own Demand.

15. The relevant increment of output to be costed is the *total* demand of *all* uses and users of a network element (or group of network elements) sought by a requesting carrier, including the demand of the ILEC itself. Hence, the relevant measure of economic costs for unbundled network elements is total service long run incremental cost, or TSLRIC.

16. Many network elements may be characterized by economies of scale. In competitive markets, capacity is sized to take appropriate advantage of those economies. Accordingly, basing the price of network elements on the incremental costs per unit of serving only a portion of total demand for a network element could inflate unit costs above efficient levels. It also would give an inefficient competitive advantage to ILECs, whose own needs for cost recovery are satisfied on the basis of the entire anticipated demand.

E. The Benefits Of Economic Pricing Can Occur Even Before The Emergence Of Facilities-Based Competition For Every Network Element.

17. The natural monopoly properties of some aspects of the local exchange market may create entry barriers that are strong enough to delay facilities-based competition for some network elements. The Commission's proposed rules will provide competitive benefits that are

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[2] This conclusion presumes, of course, that demand for use of the network element is not declining so much that the network element is becoming obsolete.

significant and immediate, however, even before full facilities-based competition develops in all segments of the local exchange markets.

18. In this regard, if competitive local exchange carriers ("CLECs") can secure the network elements they need from an ILEC at economic costs, then competition among the CLECs, and between the CLECs and the ILEC, predictably will drive end-user prices to competitive levels, and drive industry structures and costs to efficient levels. Indeed, requiring ILECs to offer network elements priced at TSLRIC-based rates (and also to offer complete local exchange services at wholesale prices to resellers) would serve the public interest even if facilities-based competition for every network element never materialized.

19. Further, requiring ILECs to sell unbundled network elements at prices based on TSLRIC will accelerate progress towards facilities-based competition by reducing economic barriers to facilities-based entry. Such unbundling and resale will enable entrants quickly to build relationships with end users based on marketing, customer service, and innovative modifications or additions to existing network elements, without incurring all of the risks inherent in making the enormous investments needed to build every element of an entire network simultaneously from scratch. The resulting commercial relationships with end users should in turn serve as a powerful springboard for integration backward through further facilities-based entry.[3]

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[3] Concerns have been raised that network elements priced at TSLRIC would be so cheap as to deter efficient facilities-based entry. These concerns are unfounded. TSLRIC is a measure of *incremental* cost, not *marginal* cost. It includes *all* of the additional costs that society incurs by asking the incumbent carrier to supply the output of a network element. If another carrier cannot produce that output as cheaply itself, then its facilities-based entry wastes resources and should not occur.

F. TSLRIC Pricing Is Consistent With Properly Applied ECPR Principles.

20. The Commission has tentatively rejected proposals of certain ILECs to base the prices of interconnection or network elements on an application of the efficient component pricing rule ("ECPR") in a form supposedly advocated by us. Notice ¶¶ 147-48. The Commission's conclusion is proper, although for reasons that differ somewhat from those articulated in the Notice. In this regard, we continue to believe that principles of ECPR are valid and serve a useful regulatory role. It is crucial, however, to understand the proper role of ECPR.

21. ECPR concerns the relationship between *appropriate* end-user prices and the correspondingly appropriate prices for inputs to end-user services, such as access to underlying facilities or, in today's language, for unbundled network elements. Under ECPR, a vertically integrated firm with market power over one or more components in the chain of production sets the price of an unbundled component at a level that does not exceed the sum of incremental costs and the contribution from the price of the end-user service that would be lost due to the sale of the component.

22. The existing structure of end-user prices for local telecommunications is *not* appropriate as a baseline for ECPR or any other pro-competitive purpose; it is utterly inconsistent with the competitive policies of the 1996 Act. Cross-subsidies are common in the rate structure, and rates depart systematically from pertinent costs. In these circumstances, the old structure of rates is the wrong baseline for the pricing of network elements through the application of ECPR.

23. Indeed, applying ECPR to the existing rate structure would result in component prices that lock in the ILECs' monopoly profits and inefficiencies, would attract inefficient entry

where rates are too high, and would preclude efficient entry where rates are too low. ECPR was never intended to (and cannot) substitute for competition for the monopoly network elements, or limit to fully competitive levels the prices paid by end users for services that use those network elements.

24. Of course, as unbundling proceeds and competition spreads as a result of economic-cost-based pricing of network elements, end-user prices should be driven toward incremental costs. With the *appropriate* end-user prices at incremental costs, the component prices dictated by ECPR are no higher than TSLRIC.

II. THE COMMISSION SHOULD PRESCRIBE BASIC PRINCIPLES FOR ESTIMATING TOTAL SERVICE LONG RUN INCREMENTAL COST.

25. Valid TSLRIC models should recognize the following basic principles:

(1) TSLRIC measures the *forward-looking* costs of providing the network element in question.

(2) TSLRIC is based on the costs an *efficient, cost-minimizing* competitor would incur -- *i.e.*, the costs of assets that are optimally configured and sized with current technology and efficient operating practices. Proper TSLRIC estimates do not simply accept the architecture, sizing, technology, or operating decisions of the ILECs as bases for calculating TSLRIC.

(3) TSLRIC includes only the *additional* costs of providing the particular network element(s) being costed, holding constant the ILEC's output of other goods and services.

(4) TSLRIC is based on the entire demand of *all* uses and users of that element or group.

(5) TSLRIC estimates should reflect significant geographic cost differences.

26. We discuss each of these critical principles in turn. We also emphasize the need to take care in allowing any "add-ons" for recovery of costs common to or shared among more than one network element (and therefore properly excluded from a network element TSLRIC estimate) to assure that quantification and allocation of such "common" costs is consistent with the competitive market model.

A. TSLRIC measures the *forward-looking* costs of providing the network element(s) in question.

27. As noted above, the most important principle is that TSLRIC measures current, prospective, or forward-looking costs, not historic, embedded, or book costs. Economic costs are forward-looking and are based on the most efficient generally available technology. Forward-looking costs provide the basis for competitive prices, define the thresholds for cross-subsidization, and govern expansion, contraction, entry, and exit decisions in competitive markets. Book costs are unlikely to reflect economic costs accurately, and basing the prices of network elements on book costs would be dangerously counterproductive.

B. TSLRIC is based on the costs an *efficient, cost-minimizing* competitor would incur -- i.e., the costs of assets that are optimally configured and sized with current technology and efficient operating practices. Proper TSLRIC estimates do not simply accept the architecture, sizing, technology, or operating decisions of the ILECs as bases for calculating TSLRIC.

28. Proper measures of TSLRIC also must exclude the costs of inefficient design or operations. This principle follows from the competitive standard because excess costs cannot be recovered in competitive or contestable markets. New entry in such markets can occur at any time, instantly, and in sufficient scale to capture all the incumbent's volume. The threat of such entry disciplines incumbents and prevents them from charging more than the incremental costs of providing a service in the most efficient, least cost manner. Furthermore, pricing at levels just sufficient to recover the costs of an efficient supplier discourages new entry by inefficient,

higher-cost suppliers. In contrast, allowing ILECs to include costs attributable to inefficient design or operations in charges for network elements purchased by rivals would weaken incentives for ILECs to operate efficiently, encourage inefficient bypass of ILEC network elements by new entrants, discourage efficient entry by downstream users of those network elements, and inflate the end user prices for local exchange and other services above competitive levels.

29. This issue is significant because the RBOCs' network architecture, design, technology, and operations reflect years of operation under the traditional rate-of-return regulatory model, which created both incentives and opportunities for ILECs to operate inefficiently and manipulate their reported costs to recover the costs of inefficient design and operations. For example, many ILEC facilities whose costs are carried in the ILECs' regulated rate bases appear to have been designed and sized to provide advanced or nonregulated services, now or in the future, and seem to exceed the efficient size and capabilities of facilities designed for regulated services alone. ILECs should *not* be allowed to include such added costs in the TSLRIC of network elements.

B. TSLRIC includes only the *additional* costs of providing the particular network element(s) sought by the requesting carrier, holding constant the ILEC's output of all other goods and services.

30. The third basic principle is one of causality: TSLRIC includes only those added costs that are attributable to production of the network element or elements. Costs that are properly attributable to *other* outputs of the ILEC, the capacity to produce other outputs in the future, or costs that would be incurred even if the network element or elements were not supplied, are properly excluded from TSLRIC.

31. Thus, the TSLRIC of a network element purchased by another carrier *excludes* costs that are attributable to (1) the ILEC's retailing operations (e.g., marketing, billing), (2) other network elements, or (3) capacity acquired in anticipation of future expansion into other activities (e.g., fiber acquired in anticipation of providing broadband video services or interexchange telecommunications services). Capacity to provide new or future services is not necessary to provide basic network elements, and an efficient provider of network elements would not incur those costs.[4]

C. TSLRIC Is Based on the Entire Demand of *All* Uses and Users of A Network Element or Group.

32. As noted above, TSLRIC includes the additional costs of serving the total demand of all uses and users of a network element (or group of network elements) sought by a requesting carrier, including the demand of the ILEC itself. Production of many network elements is characterized by economies of scale. Defining TSLRIC by reference to the incremental costs of only a portion of total demand for a network element can inflate unit costs above efficient levels and would injure consumers by giving ILECs an inefficient competitive advantage over potential competitors.[5]

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[4] We understand that the costs incurred in common between network elements and retail services are *de minimis*. Moreover, retail services are provided at a separate, downstream stage of production, and the costs attributable to retail services should be recovered from retail customers. Inclusion of these separate costs in the measure of TSLRIC would give potential purchasers and end users misleading signals about the social opportunity costs of network elements offered by ILEC, and would result in cross-subsidy by the network elements.

[5] At the same time, there may be circumstances when a price *below* average TSLRIC is necessary to protect against competitive injury. For a new service provided by an ILEC with an existing network element, the marginal cost of the service to the ILEC may be less than the average incremental cost of the network element. Under those circumstances, TSLRIC pricing may be a barrier to efficient competitive entry. Protection against this outcome would be provided by an imputation rule which requires an ILEC to offer network elements to CLECs at (continued...)

D. TSLRIC Estimates Should Reflect Significant Geographic Cost Differences.

33. TSLRIC estimates should reflect any significant geographic differences in cost. We understand, for example, that the costs of loop network elements may vary significantly by population density and topography. Ignoring these differences could give ILECs inefficient competitive advantages, particularly in high density urban areas where economies of density result in low per capita loop costs.

E. Recovery Of Carrier-to-Carrier Costs That Are Not Causally Attributable To Any Single Network Element Should Be Consistent With The Competitive Market Model.

34. Some ILECs have argued that prices for network elements must be marked up *substantially* above TSLRIC to permit recovery of costs that are shared among multiple network elements. This claim is unwarranted.

35. We understand that the portion of forward-looking costs that is unattributable to particular network elements is likely to be small. The aggregative categories of network elements generally comprise discrete physical facilities -- loop, switching, transport, and signalling. Economies of scope, or cost subadditivities, among these categories are likely to be minimal or nonexistent. To the extent that there are non-trivial common or shared costs among network elements, it is critical that the Commission establish strict limits on their recovery to avert arbitrary additives significantly above TSLRIC, which could undermine the efficiencies and protection of competition offered by the TSLRIC benchmark.[6]

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[5] (...continued)
prices not exceeding the imputed prices charged by the ILEC to itself for use of the network elements (with proper accounting for any retail subsidies).

[6] Current ILEC accounting systems often classify certain expenses (e.g., the president's salary) as "common" or "overhead" even though a large portion of the expenses may be variable with (continued...)